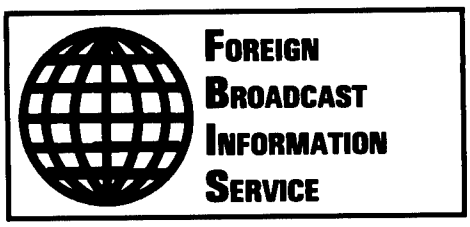
JPRS-EST-93-009
24 February 1993



JPRS Report

Science & Technology

Europe/International

Science & Technology
Europe/International

JPRS-EST-93-009 24 February 1993

CONTENTS

TELECOMMUNICATIONS

INTERNATIONAL

COMPUTERS

ENERGY, ENVIRONMENT

AEROSPACE

German/Russian Joint Scramjet Research Program Noted

93P60148 Stuttgart FLUG REVUE in German Jan 93 p 77

[Text] Since mid-1992, German and Russian researchers have been working together on the development of scramjet engines for future space transport systems.

The research program, which was begun by the DASA subsidiary MTU in Munich and the TsAGI aerodynamic research institute in Shukovskiy, is part of the hypersonic technology program initiated by the FRG Ministry of Research and Technology. The first successful tests took place last August at the TsAGI test facilities.

In scramjet engines, air passes through the combustion chamber at hypersonic speed. The combustion phenomena which arise at these speeds were examined in model combustion chambers with entry speeds of Mach 2.5 and Mach 3. A hydrogen/air mixture was used as fuel. Test conditions corresponded to an airspeed of up to Mach 7.0. The test results provided valuable information on the airflow, Mach speeds in the combustion chamber, losses in total pressure, the quality of the fuel/air mixture preparation as well as the combustion efficiency. These results form an important basis for developing future engines.

The next stage of the tests are to investigate the interaction between the individual engine components. The testing of a complete scramjet engine model, consisting of intake, combustion chamber and jet nozzle, is planned.

Europe Launches EUROPESAT

93WS0199A Paris AFP SCIENCES in French 10 Dec 92 pp 8, 9

[Article: "Launching of the EUROPESAT Program"]

[Text] Paris—During the French-German summit at Bonn on 4 December, President Francois Mitterand and Chancellor Helmut Kohl announced the launching of the EUROPESAT-1 European direct television satellite that is supposed to be in operation by the end of 1994.

Built by the French-British Matra Marconi Space company, allied with the German firm ANT, that satellite will be followed by three others and also possibly by an emergency satellite that should round out by 1996-97 the EUROPESAT system finalized by EUTELSAT. The EUROPESAT series should eventually replace the TDF1-TDF2 satellites managed by France Telecom and its subsidiary TDF. For France the operator of the four channels on EUROPESAT will be the public establishment.

Already two years ago five channels had been slated for France. Then political confirmation of the launching of EUROPESAT was awaited. It was a project, according to some well-informed sources, to which France Telecom offered some resistance. In effect, it will enter into competition with the Telecom-2 satellite system in a European market that has already been rendered competitive by the Astra satellites.

In any event the ministry of postal and telecommunications services that favors the project maintains that "since Telecom-2A is fully occupied and Telecom-2B is in the process of becoming so with the TF1 projects, there is a market for EUROPESAT." Andre Rousselet, CEO of Canal Plus, albeit not firmly committing himself, indicated "in writing" that he would be "very interested" in occupying three channels, according to the same source. One repeater could "logically" go to Arte, the French-German cultural network currently on TDF1/TDF2, with France-2's name likewise being mentioned. Much more powerful than Telecom 2 or Astra, EUROPESAT will cover France, Germany and Eastern Europe and, above all, will be capable of high-definition broadcasting.

EUTELSAT has learned that, as the operator of the eight German channels, Deutsche Bundespost Telekom has signed draft agreements with all of the German public and private networks. They will all be on board the entire system in four years. Two other Swiss and Austrian partners have manifested their desire for each to have a channel on EUROPESAT-1.

Airbus A-340 Completes Endurance Flight Tests

93WS0199B Paris AFP SCIENCES in French 10 Dec 92 p 13

[Article: "Success of the A-340 Endurance Flight Program"]

[Text] Blagnac—On 8 December, the European consortium, Airbus Industrie, announced that the A-340 "endurance and fleet-service evaluation test program" was a success. It marked Airbus's arrival on the very-long-haul market dominated up until then by American manufacturers.

Two aircraft conducted the program: an A-340-200 and an A-340-300 earmarked respectively for the Germany company, Lufthansa, and the Air France group. They completed nearly 280 hours of flight covering a distance of 240,000 km.

Based in Frankfurt, the Lufthansa aircraft made 36 flights, particularly one from Frankfurt to Honolulu (12,300 km) in 15 hours and 21 minutes, the longest flight of the test program. Air France group's A-340-300 made 27 roundtrips in two weeks including a Singapore-Paris flight in 14 hours and 30 minutes.

For those test flights both aircraft were equipped with interior furbishings and a small number of instruments. According to Airbus, "the evaluation flights showed the certification authorities that the aircraft had reached a

sufficient degree of maturity to cope with the demands of everyday operation." Certification of the A-340-200 and the A-340-300 is set for the third week of December.

INMARSAT To Use New DASA Distress Beacon

93WS0199C Paris AFP SCIENCES in French 17 Dec 92 p 11

[Article: "New DASA BEACON Distress Beacon"]

[Text] Bremen—Deutsche Aerospace [DASA] has just placed on the market a new sort of distress beacon utilizing the INMARSAT-E system and usable worldwide.

Perfected by its Dornier satellites and applications division, at the behest of the German transportation ministry, the beacon and the 12 INMARSAT satellites, supplying 99.9 percent worldwide coverage between 80 degrees north and south latitudes, guarantee transmission and reception of a distress message in two minutes at the Bremen maritime rescue coordination center, in charge of initiating searches for Germany.

Designated DASA BEACON, the beacon consists of a one-watt transmitter, a digital system for transmitting the distress signal, a receiver for constant determination of the beacon's position, a distress flare and a battery guaranteeing it 48 hours of operation.

Received by one of the orbiting satellites and forwarded to the Bremen center, the signal is embedded with all its distinguishing features: identification of the vessel, nature of the emergency signal, last position, bearing, velocity, date and time of the signal. The beacon's position is determined immediately through a GPS (Global Positioning System) receiver and continually updated.

The INMARSAT-E system does not require any special installation aboard the satellites and merely one Dornier receiver has to be added in the ground receiving stations. Twenty-five units have been manufactured so far and it is likely to interest the 500 German military or merchant marine vessels and several thousands of other vessels around the world.

ESA, Romania Sign Cooperation Agreement

93WS0210B Paris AFP SCIENCES in French 17 Dec 92 p 10

[Article: "European Space Agency-Romania Cooperation Agreement"]

[Text] Paris—The European Space Agency [ESA] and Romania will be cooperating in the areas of information exchange, training, access to databanks and laboratories, study of projects of joint interest and exchange of researchers, under the terms of a cooperation agreement signed on 11 December in Paris.

Ratified by Jean-Marie Luton, ESA's general director, and A. Vatasescu, Romania's ambassador to France, the agreement "expresses ESA's political will for cooperation with the countries of Central and Eastern Europe in the areas of space exploration and utilization for peaceful purposes," as confirmed at the last ministers meeting in Granada on 9-10 November.

This was the second agreement concluded by ESA with an eastern European country after the one signed with Hungary in April 1991.

Experts: More Cooperation in European Aerospace Research Needed

93WS0247A Bonn LUFT- UND RAUMFAHRT in German Nov/Dec 92 pp 8-10

[Article by Drs. Wulf von Kries and Walter Kroell: "Research for European Aviation: A Strategy for National Centers"]

[Text] **The European Community (EC) also manifests itself in its aircraft. The products of the Airbus Consortium, which are used throughout the world, represent Europe's technical and economic power in aviation, just as the launch vehicle Ariane does in aerospace.**

Both programs were initiated more than 20 years ago. They owe their existence to the far-sighted strategic decisions taken by the original participating governments. They succeeded because national ambitions were put on the back burner, long-term public financing was secured, and the industrial and research potentials were effectively coordinated.

It is now time to establish—in the same communal spirit—the ground work for new successes and to ensure Europe's ability to compete successfully in the face of global competition for the coming decades as well.

For some time now, within the framework of the European launch vehicle program, the development of the Ariane V booster rocket has been underway. But even for the proven medium-sized launch vehicles of the Ariane family, cost-efficient successor developments have to be initiated at the propitious time. A somewhat comparable situation also exists in the matter of European large aircraft development if such aircraft are to be built independently in the future. The Airbus Consortium program, as now conceived, has the A 330 at its upper and the recently finished A 319 at its lower development limits. While the 124-seat A 319 can be derived from the basic version of the A 320 without major changes, an entirely new development would have to be undertaken for a high-capacity aircraft with 600 or more seats. It may still be debatable as to whether such a larger transport aircraft is even feasible as a solo European undertaking. In any case, the already inaugurated R&D initiatives to assess partnership capabilities have to be pushed forward. In the case of smaller regional aircraft, individual European aviation companies have secured a leading market position in the world, which now the

German DASA Dornier Company hopes to share with its Do 328. It remains to be seen just how long the increasing internal European and worldwide cutthroat competition will permit individual companies to economically dominate this market sector in the long- and even medium-term. Meanwhile, however, at least a partially European joint development, with a substantial German contribution, a 70- to 130-seater, is being designed in the upper class of medium-range aircraft. This planned regional aircraft could result in a success, similar to that of the Airbus, and considerably strengthen Europe's position in civilian aircraft construction for some time.

But just as in the case of the Ariane, basic Airbus designs, especially those of the A 310 and A 320, will have to be modified before the end of this decade. Airbus Industrie and the major parent companies are already working on the first guidelines to this end—new fuselage and wing configurations, more advanced avionics systems, and engines with optimal fuel-consumption and environment-sparing characteristics. Our American competitors, Boeing and McDonnell Douglas, are planning comparable and perhaps even more advanced designs for their products of the first half of the next decade. Sooner or later, innovative developments must be expected from our Japanese competitors, who to date have still been rather restrained.

New challenges also confront Europe's large aircraft producers. Are they prepared to meet them? A number of factors, which in future can no longer be taken for granted, contributed to the success of the Airbus program to date.

In the past, a generous amount of public financial support was available, without which Europe's rise to become a serious aviation power would not have been possible. But it is precisely these subsidies from the various European governments that have evoked vehement criticism from the United States, whose support for the aviation industry has traditionally been indirect, by way of siphoning off technology and demonstrator programs originally carried out under NASA. Meanwhile, the U.S. Government and the Commission of the European Community, within the framework of the GATT system, have agreed to limiting direct government support to a maximum of one-third of the development costs of civilian aircraft with a seating capacity exceeding 100. This agreement conflicts with the financing policy of the European governments, and also requires that the aviation industry resort to increased funding from the private sector. But, unlike the U.S. Boeing Company, which has been commercially successful over a long period, most European aviation companies, which are capital-deficient and operate only marginally with respect to profit, are not attractive partners in the eyes of private investors. However, it must be noted that the Airbus program has in the meantime taken a turn toward economic improvement.

Another factor involved in the European success in the construction of large aircraft cannot be weighed in material terms. The American aircraft producers, who have dominated the field since World War II, have for a long time and with good reason underestimated the ability of the Old World to mount a common effort to challenge their supremacy. The joint French-British Concorde collaboration of the 1960s, although technically impressive, was an economic miscalculation. The strictly French or British home developments, the Caravelle or the BAC-11, could not prevail against the more modern, mass-produced aircraft from McDonnell Douglas, Lockheed, and Boeing on the world market. The Airbus success is to a good extent attributable to a surprise effect. Now, however, the two remaining U.S. aircraft manufacturers have decided to defy the European upstart, to defend their still leading position, and even to increase it if possible.

The European aircraft producers have to prepare now for this new competitive scrambling as the new century unfolds. To this end, a more efficient use of developmental and manufacturing capacities has to be devised. Despite all cooperative advances, the aircraft industrial base in Europe is still organized on a national basis, which is to say, it is still fragmented on a national basis. Even the Airbus program has not led to transnational company amalgamations. Instead, it is based on coordinating and combining nationally produced component parts. If the recently concluded DASA majority shareholding status in the Fokker in Holland also proceeds solely in the direction of a future international company collaboration, then most of the European aircraft manufacturers will continue as before to be small to medium-sized companies, as compared to the American and eventual Japanese competitors.

These facts have not damaged the Airbus program. Nonetheless, just as the days of massive government subsidies have ended, the preliminary costs for new developments have increased. Economic common sense and concern about the future make it necessary to reorganize the individual national capacities in Europe and to integrate them synergistically.

It is no longer possible to continue on the basis of only partially developed programs like the Airbus or ATR cooperative ventures that do not result in an effective integration of efforts. Of course, the geographic situation of the European aircraft industry requires that the production of component parts continues to be spread out, just as is practiced by U.S. producers. To preserve the structural balance, even the total integration and final assembly of the individual aircraft series will have to continue to take place at a variety of sites in different European countries. On the other hand, the aircraft manufacturers are now compelled to see that their capabilities in the matter of preliminary research and preliminary technological development must be fused together more closely than seemed possible in the past.

The reason for this is strictly of a financial nature. Even if the R&D potentials in the individual countries could continue to be supported through the use of public monies, nonetheless, the maintenance of technological competence would now increasingly have to be supported by private sources. Naturally, increased efficiency and constraints are called for. The inner European competition, which prevailed in the postwar years, resulted in a multitude of parallel activities and duplicated investments in the aviation industry. In future, the Europeans will be less able to afford this luxury. The steadily growing R&D expenditures needed for new product developments suggests that the efficiency required cross all boundaries. In other words, a partnership-like division of work and complementary resource policies has to be pursued within the European sphere. This is the only way that the necessary cost savings, which are indispensable if the European aircraft industry is to stay in the international competition, can be achieved.

A special responsibility for the required integration of industrial activity and research falls on the national laboratories. These State-supported aviation research centers, together with the university technical institutes, are the main practitioners of basic aeronautical research and have repeatedly performed decisive preliminary studies for industrial developments. They originated almost at the same time the air age began and have become integral parts of organized aviation research.

Of the seven such centers in Western Europe, three stand out: the British Royal Aircraft Establishment (since 1991, part of the Defense Research Agency), the French Office National de la Recherche Aeronautique (ONERA), and the Deutsche Forschungsanstalt fuer Luft- und Raumfahrt (DLR). But even the smaller facilities as, for example, the Dutch Nationaal Lucht- en Ruimtevaartlaboratorium (NLR), are of prime importance in their own countries.

All of these centers, as elements of their national aviation research tradition, have characteristics similar to the aviation companies associated with them in each country through a variety of working relationships. They operate primarily in the national interest and try to cover all relevant research and technological fields. For that reason, as a study of the European Community Commission characterized it: "a widely dispersed, often overlapping research system arose that was unnecessarily cost-inefficient." A condition that was paralleled in the national structure of each country's industrial R&D capacity. Of course there has long been a lively scientific exchange program and many cooperative ventures between the national aviation centers. However, commonly defined, larger scale research projects with a clear division of labor have clearly taken second fiddle as compared to each country's independent undertakings. The German-Dutch wind tunnel (DNW) and the European transonic wind tunnel (ETW) have been the famous exceptions so far. Program and resource planning in the individual research facilities continues to proceed almost independently, just as it always has.

The establishment of a coordinating group (Group for Aeronautical Research and Technology in Europe/ GARTEUR) that included four western European countries did little to improve the poor level of integration of the centers' activities. GARTEUR lacked program authority as well as its own financial resources. And self interests set narrow limits on coordinating efforts based on simply discretionary power. Even in cases where the aviation facilities had been involved in industrial cooperative ventures on a European scale, say, the Airbus program, they always acted as individual collaborators and companies on contract of their home industrial partner, rather than as members of a common enterprise.

It has now become clear to the directors of aviation laboratories that the days when each country could go its own way in European aviation research were at an end, that despite different structures, political affiliations, and financing, the future of the centers had to be formulated on a common basis. This conclusion was arrived at both out of ideational considerations as well as the bald fact that most government-subsidized centers, like the aviation industry, were now subject to economy measures and that they themselves were under pressure to improve efficiency. The number of employees had to be reduced and their expensive test facilities had to be used more judiciously, if not discontinued completely. In a shared analysis the directors of the large aircraft research centers came to the conclusion that they had to coordinate their future plans more closely with each other and that the further development of the centers had to be viewed in a defined common perspective.

The centers themselves can take the first important steps in the direction of research integration. Above all, a new, higher value has to be assigned to future cooperation in research. The cooperation should be in such fields and on such topics designated priority in the various programs and identified as of central research interest to all facilities. Technical interdependencies have to be founded on more than a simple piecing together of individual activities, and a mutual access to test facilities has to be agreed upon. Only in this way can one center work with another and all facilities develop increased dependence on each other. This alone established the prerequisite for greater efficiency and a simultaneous strengthening of the previously disparate research potentials of the various European aviation laboratories.

Programmatic concentration, deepening research involvement through true complementarianism, the establishment of dependencies, and convergent resource planning while eliminating parallel investments must be the essential measures taken for future research cooperation. This guidance outline should be elevated to a binding common obligation.

The aviation facilities are not able to take the essential steps in the direction of research integration by themselves. Their freedom of action is limited by each individual government's program restrictions and individual contractual obligations. The European Community is in a position to provide the decisive additional incentives and initiatives for a truly European research alliance. Since 1988, its still modest involvement in aviation research has been put into even more solid form in various pilot and interim programs, and a notable increase in support funding is to be discussed in the European Community's forthcoming Fourth Research Program (1994-1998).

The centers of the EC Commission have transmitted detailed proposals for its use. It is the European aviation laboratories' first common programmatic declaration. It complements the recommendations of the aviation industry and directs itself both to the intensification of existing common activities as, for example, the harmful substances in aviation program, as well as to the initiation of new undertakings.

Future EC funding support activities have to take the capabilities of the various centers into better account. The still prevailing 50 percent self-financing required of EC projects naturally limits the involvement of research facilities that scarcely have any uncommitted resources. Pursuant to its mission, the EC should target the bulk of its support to programs that lead to a synergetic common interaction between industry and research. Aviation-related environmental problems, better air traffic control in Europe, support of important disciplines like material and combustion research, which are indispensable for aviation and of great potential use for many other fields of the economy, would be excellent topics for a common European engagement, which must be raised to a higher level with respect to funding amounts and program stringency.

Central European technology support programs cannot and should not replace national subsidy programs in aviation. The respective governments bear special responsibility for the maintenance of the basic research capabilities of the research laboratories on their territory. An all-European aviation research program, established by the EC, should not be a reason for further reducing support efforts at the national level. That course of action would not just negate what the EC hopes to accomplish by complementing and supplementing the activities of the individual countries. Ensuring that national subsidies for aviation stay at prevailing levels is also an indispensable prerequisite for the success of a European involvement, whose primary goal must be to use national assets more effectively and efficiently.

The various centers, including especially the DLR, want to make their own contributions to this goal. They are ready to assume program co-responsibility and to accept the structural consequences which should in the final analysis lead to integration. When all is done, a close institutional alliance of all existing national aviation centers should result, not a centralized united organization. Perhaps the alliance will be called the "European Aeronautical Institution," whose decentralized facilities and assets would in effect be the former centers of the individual nation states. This amalgamation must be characterized by a complementary system of establishing priorities, a synergetic division of labor, and an efficient use of expensive auxiliary equipment and personnel.

The involvement of the centers can only be part of a concentrated organizational effort, with which all significant forces in politics, research and industry cooperate.

All specific, measured steps, all of which are major steps, must now be taken along this more difficult but more rewarding path.

(1) Facility—DLR;

(a) Year established—1969;

(b) Classification—registered association of Federal Ministry of Research and Technology;

(c) Part of budget for aviation*—35%;

(d) Basic financing share—2/3 700 MDM;

(e) Personnel strength**—4.300.

(2) ONERA;

(a) 1946;

(b) government facility of Ministry of Defense;

(c) 85%;

(d) 2/5 400 MDM;

(e)2,200.

(3) DRA;

(a) 1918 (RAE);

(b) government facility of Ministry of Defense;

(c) 90%;

(d) 9/10 800 MDM;

(e) 5,000 (RAE share).

(4) INTA;

(a) 1942;

(b) government facility of Ministry of Defense;

(c) 75%;

(d) 4/5 350 MDM;

(e) 1.500.

(5) NLR;

(a) 1937;

(b) Transportation Ministry;

(c) 90%;

(d) ¼ 90 MDM;

(e) 700.

(6) FFA;

(a) 1940;

(b) government Ministry of Defense;

(c) 100%;

(d) ¼ 40 MDM;

(e) ?.

(7)CIRA***;

(a) 1984;

(b) shareholding;

(c) 90%;

(d) 1/10 20 MDM;

(e) 100.

Key: (1) Facilities: DLR—Deutsche Forschungsanstalt fuer Luft- und Raumfahrt; ONERA—Office National de la Recherche Aeronautique; DRA—Defense Research Agency (1991 incorporated in Royal Aircraft Establishment [RAE]); INTA - Istituto Nacional de Tecnicas Aeronauticas; NLR—Nationaal Lucht-En Ruimtevaart-laboratorium; FFA—Flygversoekningsanstalten; CIRA—Centro Italiano di Ricerche Aeronautiche.

* - Total 1991 budget (rounded to MDM [million German marks]).

** - Total personnel strength 1991 (rounded off).

*** - In construction since 1988; estimated data.

Authors Note: Dr. Wulf von Kries, long-term association with DLR. Since 1 August 1992 business manager of MST Aerospace GmbH consulting company. Professor Dr. Walter Kroell is DLR board chairman.

Aerospatiale, Alenia To Launch Faster ATR-42

93WS0253C Paris AFP SCIENCES in French 28 Jan 93 pp 11-12

[Unattributed article: "'Imminent' Launching of a New ATR-42 Version"]

[Text] Toulouse—The launching of the ATR-42-500, a faster version of the present ATR-42 commuter, is "imminent," the ATR [Avions de Transport Regional] general director, Mr. Henri-Paul Puel announced on 26 January in Toulouse.

When it announced an 11-percent drop in its 1992 sales, the group—in which Aerospatiale (France) and Alenia (Italy) own equal interests, and which specializes in commuter aircraft—acknowledged that its order book hardly exceeded one year's work and that, therefore, it intended to renew its line.

The new version in preparation—a 50-seater with a speed of 305 knots (over 550 kilometers per hour)—represents a potential market of another 300-350 aircraft, for a moderate development cost (250 million French francs [Fr]). The old models already sold by the ATR economic interest group could also be equipped with the new engine.

In 1992, ATR (which does not publish financial results) had a "very slightly positive" result, as in 1991, but its sales dropped by 11 percent: Fr3.7 billion compared with Fr4.1 billion in 1991.

"1992 was a very difficult year. We are not completely gloomy, but very cautious," he added. ATR received only 20 orders for its ATR-42 and ATR-72 aircraft, and 25 firm orders were either converted into options or canceled. "In 1993, we hope to get between 30 and 60 orders. In production terms, ATR sold 51 aircraft in 1992 (compared with 61 in 1991) and it hopes to return to some 60 deliveries in 1993." So far, the group has delivered 315 aircraft (238 ATR-42 and 77 ATR-72).

In addition, Mr. Puel is still considering launching an ATR-82. "We have started a survey of potential buyers, to know whether they want an aircraft equipped with jet or turboprop engines," the ATR general director indicated. "The turboprop could fly at 340 knots, while the jet would get close to 400 knots. But developing a jet would cost $600 million, i.e. twice as much as the turboprop version. It is understood that we shall not manufacture this aircraft if the agreement between DASA and Fokker is extended to include our parent companies, Aerospatiale and Alenia."

If an ATR-82 is built, the French-Italian cooperation might also be opened to new partners, the general director added, and mentioned in passing SAAB [Swedish Aircraft Company] (Sweden), British Aerospace, and Asiatic partners such as China or Singapore.

BIOTECHNOLOGY

Europe: Biotech Industry Termed "Lagging," in Need of Standardized Regulations

93WS0205a Duesseldorf VDI NACHRICHTEN in German 4 Dec 92 p 3

[Article by Martin Muehleisen: "Europe Threatening to Fall Behind in Biotechnology—Restrictive Genetic Engineering Laws—Standardized Regulations Envisioned Within EC"]

[Text] Numerous pharmaceutical and chemical companies have moved their genetic engineering production

abroad. Other companies have set their hopes on the unified market—they hope for standardized European regulations which should make it possible to catch up with the U.S. and Japan.

Horst Autzen, official and section head in the Baden Wuerttemberg Ministry of Economics,is optimistic: "Modern biotechnology has many areas where the Germans can indeed hold there own." Representatives from industry see things quite differently. "There is clear evidence that Germany is lagging behind the U.S. and Japan," says Bernd Gerling, company spokesman for the chemical group BASF in Ludwigshafen. "In biotechnology research, we are already 10 years behind."

Many industry representatives share Bernd Gerling's view. Financially strong chemical companies such as BASF, Hoechst and Bayer have moved large sections of their genetic engineering research abroad. "If there is no feedback from tests, from application engineering and from the market, research is not viable in the long term," states Gerling.

Many chemical and pharmaceutical firms had expected the law on genetic engineering of July 1990 to provide a more definite legal basis for dealing with the controversial area of genetic engineering and at the same time improve its acceptance by society. However, it has become increasingly obvious that no progress has been made towards these goals. Ministry official Autzen wonders "whether the bureaucratic requirements resulting from the law on genetic engineering are really necessary at levels with a low safety risk." The facility built by Hoechst AG in Frankfurt, for the production of genetically engineered human insulin, for instance, has a safety level rating of 1; i.e. according to the law on genetic engineering, the genetically engineered bacterium which produces insulin does "not pose a risk to human health and the environment."

But so far, the chemical company has had no luck: Although the first stage of the facility, the Fermtec installation, had been started in July 1985, as of today the company in Frankfurt has not even been able to start trial operations. After approval and protest procedures stretching over several years the company had received governmental approval to start operations on a trial basis in mid-October. However, the authorities subsequently received additional protests from the population, and according to company spokesman Dieter Bauer "the district office in Giessen told us that it will not rule on our request for immediate implementation of the operating permit until 30 November 1992." Frequently, it is not the law on genetic engineering as such that causes problems for the industry, "but the way in which the law is implemented," complains BASF spokesman Gerling. As he reports, the transport permit for a genetically engineered preparation from the University of Tuebingen to BASF in Ludwigsburg alone required applications and evidence amounting to 27 kg of paper.

Katja Prowald from the communications department of Boehringer Mannheim in their Penzberg plant is convinced that "national laws and regulations on genetic engineering and bioengineering will have no meaning unless they are accepted by a majority of the EC countries."

EC guidelines on genetic and bioengineering have been available since April 1990. However, the idea of a uniform EC market for genetically engineered products will remain a dream for the time being. "Only German policy fell in line and followed the declared intention. It has implemented the guidelines to a large extent by passing the law on genetic engineering of 1991," says Katja Prowald. As she points out, several European countries still do not have any regulations concerning biotechnology.

Despite this lack of positive action, some industry spokesmen are optimistic. Arnold Kastenholz, public relations department head at Thomae, a drug company in Bieberach, expects a number of benefits from the opening of borders starting in 1993. Kastenholz expects the European internal market to result in uniform guidelines for genetic engineering and bioengineering which would lead to uniform approval procedures and operating requirements. Kastenholz hopes that this will remove existing competitive disparities.

By now, authorities in Brussels have also recognized the danger of Japan and the U.S. becoming too dominant in these promising key technologies. A budget increase by ECU400 million (about DM200 million) for the third general program for research and development (1990-1994) and the simultaneous reduction in energy funding by ECU300 million allows a redistribution of support funds, and biotechnology is one of the areas to benefit from the freed-up funds. However, as the Federal Association of German Industries (BDI) in Cologne points out, "with less than 3 percent of the budget, biotechnology is still severely underrepresented despite an increase in funding."

A good number of EC support programs are in place to help biotechnology in Europe get on its feet. However, German industry is hesitant to use these programs—Gerling estimates that 95 percent of the research is financed by the industry itself. These funds are primarily taken up by the study groups at universities. On the other hand, the first all-German program to promote biotechnology in small and medium-sized companies which started on 1 July 1992 was "received extremely well" according to the Ministry for Research. So far, about 250 companies in the new and old federal states have applied for support. More than 120 research and development projects amounting to about DM50 million have been launched.

The Senior Advisory Group on Biotechnology (SAGB), a multi-country forum of the European Council of Chemical Industries (CEFIC) which directs its recommendations primarily to politicians advises speedy action.

SAGB considers the "biotechnological revolution" both as a strategically favorable opportunity and a threat to the European economy. Either the European firms succeed in achieving a leading position in the world, or "we run the risk of becoming consumers, not producers, of this promising key technology," the SAGB states in a strategic paper on the future economic development in Europe.

German companies can be hopeful again. As early as next year the bureaucratic restrictions are to be eased by simplifying the approval process for genetic engineering facilities. In the debate on the amendment to the law on genetic engineering in the German Bundestag on 12 November 1992, Federal Research Minister Heinz Riesenhuber stated: "Through the joint responsibility of science, industry and government we need to create conditions in Germany so that research can be carried out here just as successfully as in other countries."

COMPUTERS

German Firm To Market Graphics Accelerator for Windows

93WS0243B Duesseldorf VDI NACHRICHTEN in German 8 Jan 93 p 10

[Article by Peter Lange: "Add-on Circuit Boards Speed Up Graphics"]

[Text] *VDI-N, Munich, 8 Jan 93—Do you too have a computer that is too slow in representing complicated graphics? A new graphics-accelerator circuit board will perhaps work wonders. However, often while the advertising makes impressive promises, the reality can be quite different.*

Computer add-on circuit boards used to accelerate graphics display have recently gained wide acceptance. Certain manufacturers are offering almost anything the heart desires and the checkbook can cover in a price range from $50 to $5,000.

For example, Uli Seng, head of the very active Spea Company in Starnberg, sees the lower end of this market as being characterized by "the VGA- and SVGA-boards for DOS-users and window-enterers," while the top group is represented by "high performance boards for CAD work stations" and the like. In between the upper and lower ends of the market, increasingly more "window-accelerators" have become widespread for the DOS optional system of the same name. Seng notes that "comfortable, window-oriented usage surfaces put high demands on a computer's graphics performance."

To date, the conventional VGA- and SVGA-boards could provide little help in resolving this problem, because while the boards were inexpensive, regrettably, they were not very fast at all. Since highly sophisticated "intelligent graphics boards with local storage and local processor can provide the required performance," they are also used in CAD installations. Unfortunately, they are simply too expensive for the simple processing of table calculation programs using windows.

The new window accelerators, according to Seng, now offer a reasonable combination of price and performance. And since the Starnberg group, which to date had specialized only on the top class boards, last year bought Video Seven, a producer of simple VGA- and SVGA-boards from LSI-Logic, Spea now wants to penetrate the medium-class range on a massive scale. Meanwhile, Seng even plans to expand his market position, which is probably already tops among competitors: "We want to be number one in the world."

According to Spea analyses, the market for window accelerators in the United States will grow from $300 million in 1991 to $700 million in 1995, while that of the simple VGA- and SVGA boards will shrink from $350 to $40 million in the same period. It is anticipated that the market expansion for top class boards will expand from the previous modest $30 million to $100 million.

In Europe, Seng told VDI NACHRICHTEN, the same market trend as in the United States will be observed. "The market for window-accelerators will be the big winner here both with respect to turnover as well as numbers produced." In the field of graphics boards in Europe, Spea is also "the only official partner of Microsoft," which means that his company will be in a position to acquire innovations, like Windows-NT, very quickly.

Spea, as sole source, already offers a wide product line that covers the entire market. From the point of view of the distributors, this is a highly attractive arrangement because, instead of dealing with several suppliers for different kinds of circuit boards, they need deal with just one.

Add-on circuit boards are supposed to improve the graphics capabilities of computers. However, potential buyers are hard pressed to determine the performance characteristics of the various graphics boards because the test procedures offered by the manufacturers are not comparable and are even sometimes manipulated.

Seng demonstrated how the diverse graphics board submarkets are being fought over. In the face of confusing, even false advertising, often the cheaper board of one manufacturer is actually superior to the expensive one of a competitor. Consequently, before selecting and purchasing, these "miracle" graphics boards should be thoroughly tested.

Regrettably, it is not easy to test them. Seng explicitly warns against the danger of being lured into manipulated or "deliberately misleading" test procedures, or even "benchmarks" that "do not even test what they are supposed to." They, for example, would rather evaluate the interplay between the particular system bus and the board, rather than the performance of the board itself.

Spea thinks of itself as a "traditional, strongly responsible" developer of software, which can also run on processors other than those being used in the company's current circuit boards. Seng also views the production of circuit boards almost as a safety measure. For him "hardware is the copy-protector of software," and therefore a necessity of growing importance. Soon graphics processors can be expected to appear on the market that will "make the hardware of the different circuit board producers increasingly comparable." In future, specific graphics programs could well be decisive in who wins the competitive race.

Presently, in the field of the demanding 3-D graphics boards, Seng is relying on the Risc Processor 860 from Intel. It offers a special unit for floating point processing, which is indispensable for 3-D graphics, besides "graphics functions cast in hardware." It is not only "clearly superior" to other processors, but is "extremely cheap" as well. In addition, this processor also operates in the graphics systems of the HP, DEC, and IBM computers as well as Silicon Graphics.

DEFENSE R&D

France: Rafale Construction To Begin

93WS0215C Paris AFP SCIENCES in French 23 Dec 92 p 13

[Article: "Start-Up of Rafale Production"]

[Text] Paris—The General Delegation for Weapons [DGA] announced on 22 December that the French Defense Minister, Pierre Joxe, has decided to begin industrial production of the Rafale fighter aircraft that will equip the navy and the air force about the year 2000.

The DGA is responsible for the ministry's large weapons programs and in coming days will notify Dassault Aviation industrialists of the manufacturing contract for the aircraft's airframe and SNECMA of the contract for serial production of the M88 engine equipping the Rafale. The first M88 orders will be made in coming weeks and the orders for the first two Rafale aircraft in a navy version and an air force version "in the early months of 1993."

About the year 2000 the air force is supposed to be outfitted with 235 Rafales, 95 single seaters and 140 double seaters, and the navy with 86 single seaters. In 1991, total cost of the Rafale program had been officially estimated at Fr155 billion (Fr250 million per unit) on the basis of 350 manufactured aircraft, both navy and air force versions. The manufacturers participating in the Rafale have been taxed with up to 25 percent of the development financing (Fr30 billion, equivalent to the manufacture of the prototypes). Industrialization of the program, that is, Fr10 billion, has been fully assumed by the government.

ENERGY, ENVIRONMENT

Germany: Cooling Technology Using Zeolites to Replace Fluorocarbons

93WS0139A Munich TOP BUSINESS in German Dec 92 pp 154-160

[Article by Burkhard Boendel: "Climate Pioneer Zeo-Tech: Business with the Cold"]

[Text] A young company in Munich is about to revolutionize refrigeration and climate control. Its zeolite method is not only good for the environment since it works without CFCs, it also offers technological advantages.

Peter Maier-Laxhuber checked his test set-up one more time: the vacuum flask, the strange small round stones, the water volume and the valve which separates the two elements. Finally, the researcher opened the tap and, at first, nothing happened.

The surprise came 10 seconds later: the water turned into ice instantly, and the small stones on the other side of the flask heated up. As the CEO of Zeolith-Technologie GmbH Munich remembers this memorable Saturday six years ago, "this was the technological breakthrough."

Maier-Laxhuber who has a doctorate in physics had waited for a long time for this moment. Motivated by the energy crisis in the late seventies he first searched for more effective methods of heat generation. To improve the efficiency of heat pumps an outright hunt for new combinations of substances had started around the globe in which Maier-Laxhuber also took part. "However, while everybody examined only liquid media, I deliberately went after solid media and finally hit upon the zeolites," he described his unconventional approach.

When oil prices started to fall again the heat pumps were quickly forgotten. However, this change in attitude only meant a lateral move for the zeolites. The material which is suitable for heat generation can also be used for cooling purposes (see insert below).

The adsorption method with zeolites is not only technologically equal to the conventional cold vapor process which drives refrigerators, freezers and air conditioners with the famous/infamous chlorofluorocarbons (CFCs), it is also completely harmless to the environment.

World-Wide Patent Protection

While the ban on CFCs and the new replacement coolants made of fluorinated hydrocarbons such as "R134a" turn out to be tamed climatic poisons at best, zeolite stones made of aluminum silicate are natural products and completely harmless.

Even when produced artificially they are harmless in every respect. This alone justifies Maier-Laxhuber's greatest hope that zeolites will stir up the billion dollar refrigeration and climate control market in a few years.

The refrigeration expert from Munich has planned well for this day. As early as 1988 he founded Zeolith-Technologie GmbH (Zeo-Tech) with several partners (among them professor Carl-Christian von Weizsaecker). At present, the company has a staff of 12 and annual sales of slightly more than DM1 million.

The team is very active: Zeo-Tech has filed about 200 patent applications worldwide. Although the developments have cost DM11 million so far, Zeo-Tech is solidly in the black. "We brought everything in again with paid research contracts," company boss Maier-Laxhuber states proudly.

Next comes the introduction of first production models using the new cooling and heating technology. In the fall, the Zeo-Tech team completed a hand pump which takes only seconds to produce ice in containers with a capacity of up to 20 liters. The icebox as a supplier of ice for whiskey has probably become obsolete.

Questionable CFC Replacement However, this is not enough to reach the planned sales increases of at least 50 percent per year. The company plans to raise cash primarily through licenses to refrigeration and air conditioning producers, i.e. the established refrigeration industry.

Chances for this are good. Protected by early patents (Maier-Laxhuber: "Nobody can bypass us any more") Zeo-Tech can even afford to put on ice exclusive contracts with large well-known producers of name brand products. The developers of Bosch-Siemens, for instance, who had wanted to get the rights to the Zeo-Tech know-how will probably have to wait a little longer. "We want to do business with all manufacturers," says the refrigeration researcher. He is not interested in linking up with one single partner.

Industry interest in the newcomer from Munich is great since the big firms such as AEG, Elektrolux or Bosch have now realized that fluorinated hydrocarbons which are currently being touted as an alternative to CFCs will not be viable in the long run. "R134a," currently being offered by firms such as DuPont, ICI and Hoechst, comes very close to the technical properties of CFCs which facilitates the retrofit of refrigeration devices. However, the coolant "R134a" is by no means ecologically sound. While it does not affect the ozone layer as the CFCs which will be banned soon, it does heat up the earth atmosphere when released.

And quite a bit, at that. Compared to carbon dioxide (CO_2), the main cause of the greenhouse effect, the factor is no less than 3200. The greenhouse effect of one kilogram "R134a" is equivalent to 3.2 tons of CO_2. It is not only the Greenpeace hardliners who object to fluorinated hydrocarbons as a solution to the CFC problem. According to Holger Brackemann, an expert in the Office for Environmental Affairs in Bonn, "we, too, are not happy with this material."

In car air conditioners, for instance, plastic hoses and gaskets always allow some coolant to leak. Therefore, the cooling units have to be refilled once or twice during their lifetime: the extrapolated greenhouse potential of the released coolants is almost the same as that of the engine: in a vehicle which uses 10 liters of gasoline for 100 km, three kilograms of "R134a" correspond to the CO_2 output of exactly 41,380 driven kilometers. The additional gasoline consumption caused by the compressor has to be added. And that in view of worldwide sales of 25 million car air conditioners per year.

Japanese Indicate Interest

Despite the questionable properties of "R134a," German car manufacturers are putting all their stakes in this CFC replacement. Millions have been spent on retrofitting equipment. Porsche, Mercedes and BMW have already banned the ozone killer; Audi, VW and Opel are to follow next year.

But charging ahead under the pretext of being "good for the environment" blocks the path to the real ecological material, i.e. zeolites. "The facilities have to be amortized first," a BMW employee says off the record. In Germany, the new refrigeration technology will probably not be used before the turn of the century.

Things are quite different with the Japanese: The chief developer of Sanden Corporation, the world's third largest compressor manufacturer, came personally to find out what Zeo-Tech had to offer. What Masaharu Hiraga got to see and what he carefully recorded with his camcorder in true Japanese fashion made him quite nervous. "If that can be implemented we can forget our compressors," the development chief said spontaneously.

For three months, Hiraga's engineers tried to recreate the Munich refrigeration method. To Maier-Laxhuber's benefit, without success. Finally, Zeo-Tech got a DM200,000 order to build a car air conditioning prototype. Although it is a moderate sum, it still is somewhat of a sensation: As the Zeo-Tech founder noted with satisfaction, "it is the very first time that the Japanese company had such a project done abroad."

The core of the extremely simple set-up are two alternately working zeolite heat exchangers. While one cools the interior of the car to the set temperature, the other one is being dried by the heat from the exhaust. The Sanden delegation gave proof of how well this system worked: Although several days had been planned for acceptance testing, the Japanese packed the prototype after two hours and hastily flew back to the Far East.

No wonder: They can use this unique model to study what makes zeolite technology so promising. Its environmental compatibility does not come at the expense of other benefits; on the contrary, compared to conventional car air conditioners this system is lighter, smaller and cheaper. And if the zeolites are not "used up," the car can be cooled down before starting out without the

engine running. Sanden will decide by the end of the year whether they are going to mass produce this development.

Zeolites for the Electric Car

Even if the German car manufacturers do not plan to use this development for their gasoline-powered cars, they realize the advantages of zeolite-based air conditioners for future electric cars. These cars will be offered by all manufacturers no later than 1997 because of California laws, and they do not work well with the compressor of conventional motors. When connected to the battery, the range of the electric cars which is not very great to begin with would be reduced further by an air conditioner. Here, the zeolite method is the obvious choice.

Another point: Because the zeolites heat up during cooling, a combined air conditioning/heating system can be developed which cools in the summer and heats in the winter. According to Maier-Laxhuber, this only requires proper connection of the heat exchanger to the cold or hot zone. BMW engineers are already working together with Zeo-Tech to develop such a combined climate control system for the new electric vehicles.

However, before this system goes into production, other devices with zeolite technology will have entered the market. In early 1993, the Swedish electrical group Elektrolux will market a cooler for recreational purposes which will provide cool drinks at the beach. Zeo-Tech boss Maier-Laxhuber hopes that this will pave the way: "We will use this to convince the skeptics."

Stones With Cooling Power—How Zeolites Work and Their Function in Refrigeration Technology

Almost everybody has come in contact with zeolites, a natural type of stone. Since phosphates have been banned from detergents, minerals from aluminum, silicone and oxygen are used to soften the water. About 30 different types occur naturally on earth, about 200 are synthesized today.

Two properties in particular make zeolites popular with refrigeration engineers: First, they are hollow like a sponge with a specific internal surface of about 1,000 square meters per gram, more than a soccer field in a little grain. Secondly, they contain large electromagnetic fields which attract water molecules with tremendous force.

If a proper mixture of zeolites and water is in a vacuum the little stones adsorb the water vapor above the water surface at the speed of sound, so that the low evaporation temperature causes the water to freeze after a few seconds, and it forms an ice buffer (adsorption). A positive side effect: In this process, the zeolites heat up considerably so that this heat can also be utilized. One hundred grams of zeolites produce one kilowatt refrigeration and .75 kilowatt heat output.

With specifically developed minerals, this process can be repeated indefinitely. The water-saturated small stones only need to be dried to attract water vapor again. This is done with current, gas, oil, or—in the example of car air conditioners—with hot exhaust. Then, the game can start all over again.

Compared to the cold vapor process (through compression) which is the established method of refrigeration technology, adsorption offers several advantages. Zeolites and water as the required medium are 100 percent environmentally neutral, quite different from the CFCs or fluorinated hydrocarbons in conventional devices.

In addition, they are more efficient, in particular when cold and heat are used simultaneously. Thirdly, the cold can be stored indefinitely in the stones as long as they have an air- and water-tight seal. And last but not least, adsorption is completely quiet, while compressors in refrigerators and air conditioners generate a loud humming noise.

One goal of the zeolith pioneers' developmental efforts in Munich is the creation of extremely stable minerals. One factor in their favor is the price of zeolites which are currently produced in millions of tons for less than DM10 per kilogram.

The Company

Zeolith-Technologie, GmbH, Munich; established in 1988. Sales: DM1 million; 12 employees; products: refrigeration and climate control technology with zeolites. Stockholders: Peter Maier-Laxhuber, Munich, Ulrich Albers, Zurich, Fritz Kaubek, Munich, Elisabeth and Carl-Christian von Weizsaecker, Bonn. Capital stock: DM1.2 million, an increase to DM10 million is planned for late 1992.

France Testing Diester Bus Fuel

93WS0210A Paris AFP SCIENCES in French 10 Dec 92 p 25

[Article: "10 Buses Driving Around Bordeaux on Diester"]

[Text] Bordeaux—There is a one-of-a-kind experiment occurring in the Bordeaux urban area. Since 7 December, 10 buses of the French General Transport and Enterprises Company [CGFTE] have been operating on diester, a fuel manufactured from vegetable oils, primarily rapeseed.

Valued at 310,000 French francs [Fr] and financed by the Bordeaux regional council and urban community, the operation, according to Philippe Bonnat, director of CGFTE's engineering department, will make it possible "over the course of a year to quantify the advantages and the drawbacks of that fuel."

Based on preliminary laboratory tests it is known that the combustion of diester produces less carbon monoxide and carbon dioxide, fewer particles and less sulfur

than diesel. But there are some lingering uncertainties about consumption and engine wear that have not undergone significant changes. "Just a few savings," according to Bonnat.

"We do not know whether diester guarantees as long an engine life as diesel (an average 600,000 km for a bus in an urban setting). Since our time is limited, we will be satisfied with quantifying the wear and tear of the various parts, (burnishing of the linings, dilution of the oil)," Bonnat explained while revealing the main drawback of the experiment: excessive cost of consumption. "There will clearly be excessive cost of consumption: in the course of this operation, 240,000 liters of diester will need to be consumed. And the purchase price of the new fuel is one franc more per liter than diesel and a bus in town consumes 40 liters per 100 km."

Bonnat went on to say, "we will conduct our experiment for one year and on 7 December 1993 the results will be tallied. For, after that date, we no longer will have financing to continue. Besides the engineering side, there is also the matter of getting people to use diester in their own vehicles." In the final analysis the only drawback could be the smell produced by the buses. Interestingly, it reminds one of a deep fryer.

France Testing Diesel, Diester Bus Fuel

93WS0225D Paris AFP SCIENCES in French 7 Jan 93 p 21

[Article: "Twelve Angouleme Company Buses Running on Diesel/Diester Fuel Since 4 January"]

[Text] Angouleme—Twelve STGA [Greater Angouleme Transportation Company] buses have been running on a mixture of diesel fuel and diester since 4 January. Diester is a fuel manufactured from vegetable oils, mainly rape oil.

These 12 vehicles, out of the STGA's fleet of 92, will travel 800,000 km in 1993, or 20 percent of the fleet's total distance, under a testing contract signed by Mr. Georges Chavanes, deputy mayor of Angouleme and president of STGA, and Mr. Frederic Staat, representative of the SOFIPROTEOL Company, the supplier of the diester. Cost of the operation: Around Fr400,000, financed by, among others, the Greater Angouleme District and the Poitou-Charentes Regional Council.

German-Developed Electrochemical Solar Cell Assessed

93WS0243A Duesseldorf VDI NACHRICHTEN in German 8 Jan 93 p 15

[Article by Peter Frey and Rudolf Weber: "Cheap Cells to Tap the Sun: Sandoz and ABB Show Interest in Electrochemical Power Sources:]

[Text] *VDI-N, Lausanne, 8 Jan 93—An electrochemical solar cell, developed at the Swiss Technical University in Lausanne, could soon make solar energy more attractive. Moreover, the new development is cheaper than the conventional silicon cells. Long-terms tests will determine whether they are sufficiently durable as well.*

Take two glass plates, one side of each of which has been coated with vaporized stannic oxide, apply a white paste consisting essentially of titanium oxide to one of them, then bake the entire package in an oven until the titanium oxide is colorless and transparent. Now apply a paper-thin layer of a special dye and pour an iodine solution over it. When such a solar sandwich is covered with a second glass plate and properly oriented to the light, an electrical current begins to flow between the upper and lower stannic oxide layers.

When Michael Graetzel, associated with the Institute of Physical Chemistry of the Swiss Technical University in Lausanne, presented the solar cell to the scientific community in the spring 1991, he was laughed at by more than a few of his colleagues. Meanwhile the laughing, even that of the producers of conventional photovoltaic elements, stopped last year when Michael Graetzel and his team reported a fantastically high efficiency level for their electrochemical solar generators. According to data from the Lausanne Technical University, the cells operate with an efficiency level exceeding 10 percent in the presence of direct sunshine. With a conversion rate of 12 percent in the presence of an overcast sky, they even surpassed the silicon competition.

When he began his experiments in the late 1970s in Lausanne, Michael Graetzel had an entirely different goal in mind. At that time, photolysis, the decomposition of water into hydrogen and oxygen by means of sunlight, was the research target. His models then were the British and German researchers who had developed the first so-called micro-heterogeneous systems capable of effecting such a decomposition. This is a process similar to that which occurs in plants during the first stage of photosynthesis.

In micro-heterogeneous systems, electrons are released in a very finely dispersed active substance (sensitizer) by the light. While in the case of plants, apparently the rapid further conductance of the free charge carriers through neighboring chlorophyll molecules assure that the electrons are not instantaneously captured again, the sensitizer of the artificial cells is coupled to an acceptor, which captures the electrons instantly.

The Swiss Technical University researchers achieved their breakthrough by means of a combination consisting of an organic dye as sensitizer and titanium oxide as acceptor, which transports the free electrons to the conductor. The additionally applied iodine solution ensures the return transport of the electrons to the dye layer. This arrangement functions so well that the Lausanne scientists have already attempted to build a current-generating photocell.

To be sure, one important weak point is the low efficiency level (4 percent) of the Lausanne solar sandwiches. Only after the inner surface of the titanium oxide layer—and consequently the surface for capturing the light through the dye—had been drastically enlarged, did the energy yield of the cell jump up.

The search for the optimal organic dye was pursued together with specialists at the Sandoz Chemical Company in Basel. While Graetzel remains optimistic, Sandoz researcher Roland Entschel warns against exaggerated expectations: "The stability of the dye under various weather conditions, problems related to the thickness of the cells, as well as the stability of the solution system have been little studied."

Were these problems resolved, then the electrochemical solar cells could be produced at a fraction of the cost of their silicon sister cells. It is therefore no surprise that the ABB Electrical Company is already working on the technical and economic questions involved in series production.

FACTORY AUTOMATION, ROBOTICS

Swedish Research Into Robot Vision Reported

93WS0219A Stockholm TEKNIK I TIDEN No 4 in Swedish 1992 p 4

[Unattributed article: "Robot That Sees Like Us"]

[Text] The human eye has unique mechanical and optical properties. It is movable, adjustable and sees in three dimensions. In conjunction with a person's ability to process and classify all the information that is gathered, the eye is an incredibly complex structure and a combination of flexibility and performance that is almost impossible to surpass.

These facts are an essential basis of the ESPRIT project known as VAP, Vision as Process, in which Sweden is represented by the Royal Institute of Technology [KTH] and Linkoping University.

The goal of the VAP project is to come up with an autonomous (self-directed) system of visual perception based on people's active and automatic reactive behavior.

"There should be a broad use for vision and all the information that exists naturally free of charge," said Professor Jan-Olof Eklundh of CVAP (Computational Vision and Active Perception Laboratory) at the KTH Institute for Numerical Analysis and Computer Science.

Interdisciplinary

He and his colleagues at CVAP are currently also involved in another ESPRIT project—INSIGHT—which has participants from England, France, Italy, Germany, Holland, Belgium, Switzerland and Sweden.

The idea here is to have an interdisciplinary cooperation and approach to the questions that are dealt with. Therefore the groups are made up of one-third physiologists, one-third psychologists and one-third technicians.

In this work KTH is in close contact with English and German researchers in order to study how people react and how the movement and vision of the eye can be linked to a machine's way of seeing, fixing on an object, and evaluating.

"Our English colleagues study and evaluate human vision and reactions, our job is to produce algorithms for technical solutions," Eklundh explained.

Quantity of Data a Hindrance

Researchers and technicians actually proceeded on the basis of human behavior when they developed new technology and used people as a yardstick. But according to Eklundh a very important factor has been missing.

"Seeing and understanding the world are not the same as looking at pictures of it. No one has really defined what a technical system for visual perception should be and how it should function.

"People sift out a lot of irrelevant information. In earlier technical systems they were flooded with the quantity of information because they tried to depict and describe far too much. This in turn was a hindrance to advancing technology toward the right goal," Eklundh maintained.

Robots in Space

At the same time he pointed out that the many systems that are designed to handle relatively few tasks are advanced and function well.

For example, KTH is part of a project within the European space program that involves computerized visual perception. Robots on board space ships must be programmed to carry out certain tasks; they will work autonomously and be capable of carrying out, confirming, and reporting their actions.

"It is not the task-specific systems that are the problem, but the complex and flexible ones. There has been a belief that all information must be gathered and classified.

"Instead we must concentrate on systems that build on the smallest possible amount of simple information with the help of the right sensors and processors while still being autonomous," Eklundh stressed.

Like Human Head

Human vision is a question of degrees of freedom, in other words eye and neck movements.

At KTH an anthropomorphic (meaning similar to human) system with just 13 degrees of freedom has been developed. The system, actually a kind of camera head

that moves like a human head when it follows an object, is guided by 13 separate computer programs and operated by 15 motors.

"It imitates eye and head movements, which means we can simulate human vision. We have made the most advanced head of the three that currently exist in the VAP program, perhaps the most advanced in the world at this time."

The head and cameras can be turned and "aim their gaze" at a speed of up to 360 degrees per second (180 degrees each for the cameras and the "neck"). The properties correspond closely to human vision.

"However our system has several limitations. The mechanical solutions have not come far enough and the processors are not as powerful as they ought to be to follow objects smoothly and really reliably.

"Another limitation is that unlike us, the cameras cannot perceive what is happening on the sidelines while it is gazing straight ahead, something we make use of when we move around and when we drive a car, for example," said Eklundh.

Real Time System

Robot vision/mechanical vision is a natural element in many industrial contexts today. Continued research in the area is also starting to bear fruit as technical development makes rapid progress and computer power improves. Real time systems can therefore be a reality in this area too.

Within VAP a theoretical software architecture for an integrated real time system has been produced. The architecture includes the description and determination of images in real time, three-dimensional description of information concerning object identification and checks for stereovision.

"The closer to the human eye and human vision we can come the better the information and decision support will be. Autonomous systems cannot be competitive until they can handle the same functions as we humans. If we can build a robot system that controls its functions in the same way as humans and the human eye there will be many industrial applications," Eklundh said. Contact: Jan-Olof Eklundh, Institute for Numerical Analysis and Computer Science, KTH, 100 44 Stockholm. Telephone: 08-790 81 61. Fax: 08-723 03 02.

LASERS, SENSORS, OPTICS

CNRS, MPG To Build VLT Auxiliary Telescope

93WS0215B Paris AFP SCIENCES in French 23 Dec 92 p 11

[Article: "Agreement to Implement VLT, VISA Interferometric Program"]

[Text] Paris—The National Institute of Universe Sciences [INSU] (France) has announced that the National Scientific Research Center [CNRS] and the Max Planck Gesellschaft [MPG] (Germany) will each finance DM4.75 [million] (Ffr16 million) for construction of a telescope 1.8 meters in diameter and having a delay line.

An agreement to this effect was signed on 17 December at the headquarters of the European Southern Observatory [ESO] in Garching (Munich suburb). It falls under implementation of ESO's Very Large Telescope [VLT], a collection of eight telescopes with an 8 m diameter to be built on the Cerro Paranal (Chile) by the start of the next century.

Altogether, three auxiliary telescopes of 1.8 m diameter and their delay lines, comprising the VLT Interferometric Sub-Array [VISA], will be installed in the proximity of the VLT. Two of those instruments and their delay lines will be financed by the ESO; the third, the subject of the agreement, will be financed jointly by CNRS and MPG. The telescopes will be installed on the Cerro Paranal in 1997 and are supposed to be linked to the VLT's first 8 m telescope as of the year 2001. They will enable observations to be made in interferometric mode and also facilitate resolution of the technical problems posed by that new type of observation so that, afterwards, the four VLT telescopes can be used in this mode.

In the optical sector, the interferometric mode (already widely employed in radioastronomy) consists of superimposing in the same focal plane images formed in the focus of several telescopes to improve resolution of the instruments. By recombining those beams in "coherent mode," the four VLT telescopes will then be equivalent to a 100 m diameter instrument.

Founded in 1962, the ESO comprises six [seven are listed] countries: Germany, Belgium, Denmark, France, Italy, Sweden and Switzerland. It operates 14 optical telescopes at La Silla (2,400 m altitude), in the Atacama desert, 600 km north of Santiago, Chile. The Cerro Paranal (2,664 m altitude), ESO's second site, where the VLT and VISA will be installed, is located north of La Silla, 130 km south of Antofogasta.

NUCLEAR R&D

France: CEA, COGEMA Sign R&D Agreement

93WS0225C Paris AFP SCIENCES in French 7 Jan 93 p 17

[Article: "New CEA-COGEMA R&D Outline-Agreement"]

[Text] Paris—The CEA [Atomic Energy Commission] and its subsidiary COGEMA [General Nuclear Materials Company] signed a new outline-agreement, on 6 January, covering research and development with respect to the fuel cycle. It is valid until 2003.

A joint statement released on 7 January indicates that this agreement "outlines the conditions under which the CEA and COGEMA intend now to define, finance, execute, and evaluate research and development programs involving COGEMA and carried out by the CEA in COGEMA installations." The results of these programs are to be turned to good industrial, commercial, or other account.

The relationship between the CEA and COGEMA covering R&D with respect to the fuel cycle (isotopic separation, reprocessing, fuels) has been governed to date by a basic agreement dating back to 1978. The new agreement "clarifies" the relationship between the two partners for the long term, and "determines the rules of the game for a research effort to be conducted in an efficient and exacting manner."

The agreement is valid until 2003, but it allows for reexamination of its provisions at specified times. It "supplements the provision for the contracting and financing of nuclear research that was instituted in 1992 with the first tripartite CEA-EDF [French Electric Power Company]-Framatome agreement covering the field of nuclear reactors and fuels."

In conclusion, the release states that, under the new agreement, "the research and development programs deemed to be of joint interest will be defined, planned, and supervised by joint committees formed between COGEMA and CEA. These committees will be asked to monitor diligently all factors contributing to the cost of these programs."

SUPERCONDUCTIVITY

Germany: Research on Superconducting Generator

93P60149 Duesseldorf HANDELSBLATT in German 10 Feb 93 p 26

[Excerpt] In Germany, Siemens AG's Energy Production Group has been working for many years on a development program which is supported by the Federal Ministry for Research and Technology. This program will build a 400 MVA (megavoltampere) test generator as a step toward developing an 850 MVA prototype generator. The 400 MVA test rotor, which simulates the helium cooling system of the 850 MVA generator, is almost finished. After it is successfully tested, the findings will be used in the construction of the 850 MVA prototype generator. This generator is then to be tested in a power plant. However, the development stages have been delayed somewhat by Siemens AG, since at the moment the main demand is for generators with less output.

The possible future use of the new ceramic superconductors in the generator rotor will not alter much in the generator design. However, because of the simpler nitrogen cooling, the cooling equipment will be less expensive. Thus this generator would be feasible even for smaller outputs, which would help this innovative generator to make a breakthrough.

German Developments in Superconductor, SQUID Applications

93WS0229A Stuttgart BILD DER WISSENSCHAFT in German Jan 93 pp 24-29

[Article by Wolfgang Hess: "Crumbling Resistance"—first paragraph is BILD DER WISSENSCHAFT introduction]

[Text] The new superconductors must now prove themselves. Barely seven years after their discovery, high-temperature superconductors are on the way to industrial application. Even building collapses could be prevented by them.

The event was over after only seconds, but the reverberations can be felt to this day. In May 1980 the Berlin Congress Hall collapsed. One person died and the property damage ran into the millions. The reason for it was not sloppy construction, but corrosion of the steel of the prestressed concrete. Brittle steel was also the reason why the indoor swimming pool in the small Swiss town of Uster collapsed in the mid-1980s. The terrible end result: 13 dead. Fortunately, building collapses like these two are rare in Central Europe. And yet the danger lurks everywhere. "In the Federal Republic alone, there are probably 2,500 prestressed concrete bridges which, because of their age and the kinds of steel used in them, are probably in urgent need of being inspected," Gottfried Sawade, of the Baden-Wuerttemberg Research and Materials Testing Institute, said.

Because of the special way in which prestressed concrete is made, no cracks are apparent from the outside, even if the metal inside it is already rusted through in some spots. That is why the building collapses without warning. For many years the only way to detect the damage was to knock off the concrete in spot checks to expose the steel. It is only recently that it has been possible to examine the steel without destroying the concrete. Especially promising in connection with this are sensors which do not fail to detect even minute changes in the earth's magnetic field. These sensors detect even differences in the magnetic field as small as those produced by a rebar in concrete that has rusted through. Such sensors are called superconducting quantum inteference detectors, SQUIDs for short in the jargon of the physicists. SQUIDs are a hot favorite for broad commercial application of these high-temperature superconductors first discovered in 1986. They even register magnetic fields that account for only a 20-millionth of the earth's magnetic field. (The earth's magnetic field is 3×10^{-5} teslas at the equator and 6×10^{-5} teslas at the poles.)

SQUIDs are well-suited not only to the detection of damage to inanimate materials; they are also sensitive enough to locate organic disturbances by monitoring heart beat and brain currents. This is why SQUIDs are

well on the way to becoming established as a new medical diagnosis technique.

What sounds complicated—superconducting quantum interference device—can be quickly explained in principle: Current flows through a resistance-free loop. If a magnetic field permeates this loop, there is a drop in voltage that can be directly measured. Thus this signal is an indicator of changes in the magnetic field. Currents, of course, flow free of any resistance only in superconducting materials.

To allow currents to flow without electrical resistance and thus without loss of power, until 1986 [superconductors] had to be cooled down to temperatures close to absolute zero (-273.2°C, equal to 0° Kelvin). Strictly speaking, down to 250°C, since that was the transition temperature attained up until then at which certain materials became superconducting. Liquid helium was used as a coolant for this purpose.

In March 1986 the Swiss, Karl Alex Mueller, and his German colleague, Johannes Georg Benorz, discovered a new class of materials composed of ceramic oxides, in which currents flowed free of resistance at 35° Kelvin. So-called high-temperature superconductivity was born.

In early 1987 the industry's attention was directed toward the new kinds of compounds when the team headed by the American, Paul Chu, in Houston demonstrated superconductivity at temperatures as high as in the neighborhood of 196°C. With these compounds, the expensive coolant, helium, could be dispensed with and they could switch to the lighter, more manageable, and inexpensive liquid nitrogen. Liquid nitrogen costs only a fifth as much as liquid helium. With this development, superconductivity moved out of physicists' collection of curios into the limelight of the press. By 1988 the transition temperature had risen to -143°C (130° Kelvin). This record stands to this day. No one has compartmentalized the results that are now following one another in rapid succession better than Japan. Where countries like the United States or Germany applied for dozens to hundreds of patents, the Japanese registered thousands of them. Market research companies still only referred to the world market volume of future applications in terms of billions. While the American information service, High-Tech Materials Alert, came up with a still comparatively modest prognosis of $1.8 billion for the year 2000 and Paul Winson, the head of research for the British superconductors firm, Oxford Instruments, predicted sales volumes of up to $7 billion, a Japanese study predicted volumes of as high as from $20 to $34 billion.

And today? At the latest status seminar, "Superconductivity and Low-Temperature Technology," recently held by the VDI [Association of German Engineers] Physical Technologies Technology Center in Potsdam, Prof. Johann Hinken, the secretary of the Research Society for Information Technology in Bad Salzdetfurth, complained: "During a poster session we had a total of 86 contributions, not a single one of which was concerned with a concrete application."

Have we Germans now become dependent [on others] in the field of high-temperature conductivity as we have in the field of microelectronics? A clear answer to this question was also given at the seminar sponsored by the minister of research: "As was demonstrated at the most important conference in the world on applied superconductivity, the Applied Superconductivity Conference in Chicago at the end of August 1992, the Americans and the Japanese in particular listened very carefully to what is being done in Germany. I think that we're nearly on a par with these big technology nations," Prof. Rudolf Huebener, of the University of Tuebingen Physical Institute, said.

But the fact that equipment and devices that are based on the effect of high-temperature superconductivity will be a while in coming is not only a German problem. "Many years go by before a technological discovery is really operational," Prof. Christoph Heiden, the director of the Institute for Layer and Ion Technology at the Juelich Research Center (KFA), realizes. The laboratory model for the detection of damaged prestressed concrete was developed at his institute. And along with a department of the Karlsruhe Center for Nuclear Research, his institute is the facility with the most extensive public budget for high-temperature superconductors (1990 budget: Karlsruhe DM12 million, Juelich DM13 million) in Germany.

It will also be a few years before the detection of damage to prestressed concrete—the idea for doing this came during a fair in 1991—can be practically applied. Reinhold Wagner, of the KFA Technology Transfer Office, estimates that it will be another three years before such equipment is really ready to go into production: "It has been demonstrated that it basically works, but we still need a lot of field tests before we can interpret the signals 100 percent correctly." The first SQUIDs based on high-temperature conductivity have, nevertheless, been on the market in Europe for well over a year now. They are offered for sale by the Research Company for Information Technology, a subsidiary of the antenna manufacturer, Fuba Hans Kolbe and Co. "So far, we've sold 10 SQUID chips," company manager Hinden revealed to us, "at a price of about DM3,000." Only a thin layer of the superconducting material—an yttrium-barium-copper oxide, referred to as YBCO material in English—which is applied by means of a technical process in common use, is required to produce the chip. Together with the electronics that go with it, of course, a complete SQUID system quickly adds up to DM20,000.

Firms that pay that much money for a sensor naturally also hope that it will provide them with commensurable economic advantages. Hinken sees potential customers for his SQUIDs in the fields of biomedicine (measuremant of heart and brain currents) and the testing of materials without destroying them.

In addition, his company has been working on a completely different application of high-temperature superconductors, namely, communications technology. Hinken sees the most obvious market potential in the field of mobile radios. From 20 to 40 channels are at present being transmitted from the antenna of a fixed station. To prevent them from interfering with one another, so-called band filters, which exclude interference by neighboring channels, must be installed. The quality of these filters thus determines the number of subscribers that can be connected to one antenna.

"If we use higher quality filters, the number of channels and with them the possible number of subscribers to a mobile radio network may be doubled, which will lower the cost per subscriber. High-temperature superconductors are the obvious choice for this because the filters shield a channel in a narrower band and thus an antenna can handle more channels," Hinken explained.

The work being done by the Siemens Corporation Accelerator and Magnet Technology Department in Bergisch-Gladbach (formerly called Interatom) is also aimed in this direction. The department presented an exhibit at the conference in Potsdam which demonstrated how a superconducting antenna can eliminate interference produced by the phase displacement of the high-frequency waves resulting from reflections off buildings. This interferes with radio paths: Often only snatches of speech get through or speech volume fluctuates unpleasantly. With the aid of "adaptive zeroing," it would be possible to eliminate interfering frequencies.

Since superconducting antennas are much more efficient than conventional copper antennas when the dimensions are small (60 percent as compared with 4 percent), more complex functions can be incorporated into superconducting antennas without a loss of transmitter power. Prof. Heinz Chaloupka, of the Wuppertal Polytechnic, hopes to convince manufacturers of mobile radios within five years of the advantages of this innovative technology so that they will include adaptive zeroing in their design when they develop the E network or, at the latest, the F network.

Chaloupka will certainly be participating in a space experiment scheduled to begin in early 1993. His institute delivered a superconducting antenna for the High-Temperature Superconductivity Space Experiment (HTSSE) as early as two years ago. Because of various delays, work on the satellite has only now begun without, of course, Chaloupka's having had a chance to adapt the antenna to the new findings. On the contrary: The deadline for the equipping of the second HTSSE satellite is as soon as within the next few months. The Wuppertal institute will also be participating in this. Operations will, however, begin in 1995 at the earliest.

Dr. Wolfgang Ludwig, the head of the Physical Measuring System Department at Dornier, Ltd., in Friedrichshafen, which belongs to Daimler-Benz, is also eyeing space. He is thinking about a successor to the European environment satellite, ERS1, launched in the summer of 1991. This satellite accurately locates surfaces on earth as small as 30 x 30 meters by radar, even though it is nearly 800 km away from earth. "If signal processing by superconductors could be extended to a higher frequency range, we would obtain even more accurate pictures," Dornier representative Ludwig explained.

Wide-band spectrometers offer another possibility. With them environment researchers could finally accurately study the ozone balance of the lower atmosphere. Of course, satellites that carry systems like these into space will probably not be launched before the turn of the century.

For Eckhardt Hoenig, a researcher responsible for superconductivity at Siemens in Erlangen, there are three sectors in which high-temperature superconductors will soon have a chance of being incorporated into industrial products:

- biomagnetic diagnosis,
- interference-free quality monitoring,
- ultrafast data communication.

All three sectors have two things in common: Only thinly coated superconductors are required and no strong currents flow through them. This also outlines the areas in which there are still problems with superconductivity technology: "All studies that tackle the problem of power transmission result in the unanimous conclusion that superconductivity at today's prices is at best profitable with a current strength of 10,000 amperes or more per square centimeter of conductor cross-section," Dr. Guenther Bogner, of the Siemens research laboratory in Erlangen, made it clear.

The electromagnetic fields that are generated also constitute some tough nuts for the researchers to crack. According to Bogner, at the present time the superconductivity of a power cable with a field strength of about 0.1 tesla has to be kept constantly stable. There are hardly any problems yet as far as constant stability is concerned with transformers (0.3 tesla), but high-temperature superconductivity immediately crumbles with generators (5 teslas) or completely breaks down with particle accelerators (up to 15 teslas). Furthermore, flexible, kilometer-long power lines are still out of the question. Since superconducting ceramic materials are by their very nature anything but flexible.

Material researchers are nevertheless thinking about how they might outfox this inflexibility. Thus, researchers at the American Superconductor Corp. in Watertown, Massachusetts, have succeeded in transmitting current densities of 500 amperes per square centimeter through high-temperature superconductors. As the company has now reported, the bending strain to which the conductor was subjected during a test was as great as if the conductor had been rolled around one's index finger. The Americans achieved this flexible, elastic behavior by putting together a power cable composed of as many as

10,000 microscopically thin, individual wires. The power cable was 3 cm thick, but only 1 meter long.

Asea Brown Boveri's (ABB) latest reaction also shows that they are still a long way from power transmission via superconductors: "We've invested many millions in high-temperature superconductivity," Prof. Adolf Josef Schwab of the ABB research center commented, "and have at present come to the conclusion that it is of no great relevance to us for the time being. We are therefore withdrawing to observer status."

Barely seven years after the discovery of the new kinds of superconductors, we get the following picture of the situation: The technological advances are most evident in communications technology as well as in the measurement of minute magnetic fields in living organisms or in the inanimate world. For Dr. Bernd Kramer, the project director in charge of "physical technologies" at the BMFT [Ministry for Research and Technology], this means: "I think that in one or two years we'll no longer have to provide aid for a number of these applications because they will be nearly marketable products by then."

Things do not look so good with operations in the energy production and transmission sector. To be sure, Kramer is impressed with the advances being made in that sector too. But a lot of power will still be falling victim to resistance before high-temperature superconductors begin to play an [important] role in the national economy.

However, probably nothing will change in the near future with respect to the aid provided by the BMFT amounting to about DM50 million a year for some 100 projects.

Superconductivity: Project Aid by Bonn

This aid is mainly for high-temperature superconductivity. In millions of German marks it amounted to: 1.2 in 1984, 1.8 in 1985, 4.5 in 1986, 5.5 in 1987, 16 in 1988, 35 in 1989, 45 in 1990, 47.2 in 1991, 51.9 in 1992, and 49 in 1993. The source for these figures is the VDI Technology Center, Duesseldorf. Following the discovery of the new superconductors in 1986, the minister of research has proven to be open-handed: Thus, aid for projects alone has amounted to about DM50 million a year.

Researcher Competition: Who Is Ahead in Which Sector

High-Temperature Superconductors	United States	Japan	Germany
SQUIDS	++	+	++
High-frequency applications (antennas, etc.)	++	+	+
Logic (new kinds of digital circuits)	++	++	
Current conductors	+	++	+
Low-temperature Superconductors	**United States**	**Japan**	**Germany**
SQUID systems for biogmagnetism (brain and heart-current measurements)	++	+	+++
MPI [Max Planck Institute] superconductivity (magnetic resonance imaging)	++	++	++
Superconductors for particle accelerators	++	+	++

Source: Hoenig, Siemens.

In the opinion of the experts, German research on superconductivity is doing well. However, the United States and Japan are a bit ahead of us with the new superconductors.

TELECOMMUNICATIONS

No Agreement on HDTV Budget

93WS0210C Paris AFP SCIENCES in French 17 Dec 92 p 17

[Article: "No Agreement by the '12' on HDTV"]

[Text] Brussels—The Community's British chairman indicated that the Twelve's telecommunications ministers separated on 15 December without coming to an agreement on an action program for the development of high-definition television [HDTV] and large-format television sets.

The British are opposed to the other 11 member countries over the program that had been slated for five years and initially provided credits of ECU850 million. A consensus emerged on the basis of ECU500 million among the 11 countries favoring that program, but the British have refused to go along with it, blocking its adoption.

According to the British, a budget of nearly ECU300 million will be available in 1993 for research and development from which ECU80 million can be lifted for HDTV if an agreement is reached during the upcoming year; but this solution would still imply full repetition of the legal procedure.

Guy Coeme, the Belgian minister, stated, "HDTV is an area where the Europeans are ahead of the Americans and the Japanese. We must not hem and haw to the point where this lead will be lost."

The action program aims to encourage the spread of the 16/9 format by motivating the audiovisual industry to use it for its programs. The principal manufacturers of large-format television sets in Europe are Thomson (France), Philips (Netherlands) and Nokia (Finland). Zuccarelli emphasized, "manufacturers are not waiting for money but for a supply of programs that will encourage the spread of the television sets."

Replying to British remarks according to which the action program promotes standards that could be superseded by digital technology in a few years, the French minister said, "At present there is only the D2-MAC standard for broadcasting the 16/9." He did, however, mention that the action program did not exclude recourse to other standards once they became available on the market.

COMPUTERS

ABC Bull, IPT Join Forces on Plant Management

93WS0256A Sao Paulo GAZETA MERCANTIL in Portuguese 8 Jan 93 p 5

[Article by Rosa Webster]

[Text] Sao Paulo—ABC Bull and the Institute of Technological Research (IPT) are initiating a partnership work project associated with the agreement signed by the Brazilian and French governments last year. Also involved are other business firms and research institutions engaged in seven areas considered priorities for the country: biotechnology, public administration, education, health, urban policy, agriculture, and environment. Aurelio Takeshi Iwasa, the first-named company's technology director, explains: "ABC Bull and IPT will conduct research on and develop a system to aid the decision-making in sugar and alcohol plants."

ABC Bull will participate, with its "know-how," in developing data processing tools to assist the user in making a strategic decision in his business. The Charme language is to be applied in the work planned for this project. Mario Miyake, chief of the Systems Technology Group in IPT's Systems Economy and Engineering Division, adds that IPT, in turn, "will contribute, with its 'know-how,' to the modeling of systems. That is, it will help to develop the response to a specific problem, in this case, improving the operation and administration of a plant."

The Leading Edge Technology Program, in which the IPT-ABC Bull partnership is included, stipulates that the project is to be carried out in two phases, each lasting 12 months. Plans call for the prorating of funds among those involved in the project. Brazil will be required to provide study grants worth a total of $240,000, through the Program for Training Human Resources in Strategic Areas (RHAE). The French government, the French Bull company, and ABC Bull will join with $200,000 each during the two-year duration of the project.

Dijon University is also participating in the exchange, because it is considered one of the world's most advanced centers engaged in developing systems simulating the way in which a human being reasons before making a decision. Since the 1950s, the French Bull company has formed groups involved in artificial intelligence, such as the European Computer Research Center (ECRC), now deactivated.

Currently, the specialists in the field prefer to call it "applied intelligence." ABC Bull's technology director explains: "The academic research promised progress that, in fact, it failed to achieve; and since the 1980s it has opted to develop language and systems capable of storing experience, geared to acquiring human experience in certain sectors."

Iwasa estimates that the first phase of the project will be completed in less than a year. It calls for the creation of a model of a sugar and alcohol plant that actually exists, operating in the Ribeirao Preto region. The IPT and ABC Bull technicians will simulate the environment and all the processes taking place in a plant. Planned for the second phase, that of the prototype, is the detailed specification of those items, while an experimental system will provide options supporting the strategic decisions. This involves details ranging from the collection of raw material to truck routes, as well as the production process.

ENERGY, ENVIRONMENT

Brazil Moves Toward Clean Technology

93WS0257A Rio de Janeiro JORNAL DO BRASIL in Portuguese 31 Jan 93 p 20

[Article by Guilherme Fiuza]

[Text] Two years ago, when the Canadian, Maurice Strong, general secretary of Rio-92, claimed that the planet's salvation depended on the reformulation of "entire industrial processes," many Brazilians took the warning as a piece of rhetoric. Starting this year, however, with the Law on Environmental Audits (No. 1898/91) going in effect, the reformulation of environmentally harmful industrial technologies, materials, and equipment in Rio de Janeiro will definitely become a part of reality.

The new law specifies that the most dangerous industries must pay annually the cost of complete "X-rays" of their facilities, taken by entities approved by the public authorities. In iron and steel, metal-working, and chemical plants, as well as oil refineries and terminals, among others, "every time any violations have been found, quarterly audits must be made until they are corrected," according to the law.

Small Universe

In fact, the law has a strategic coverage as its author, Deputy Carlos Minc (PT [Workers Party]) demonstrates: "Of Rio's 10,000 industries, 150 cause 90 percent of the pollution. Only these will be required to have audits," he explains. The UERJ [Federal University of Rio de Janeiro], which participated in devising the law, has already offered technical and laboratory support for its implementation.

The UERJ rector, Ezio Cordeiro, gave an example: "We shall evaluate the water quality with portions of fish enzymes, already tested in the Paraiba River."

The audits must also individualize the origins of the pollution. For example, in the chemical sector the organic synthesis phase for producing dyes, toxic agricultural substances, and other products generates hundreds of pollutants that are already known, chemical engineer Katia Medeiros, adviser to the Legislative

Assembly's Science and Technology Commission, explains that the complexity of chemical reactors began to be studied in the industrial countries less than 10 years ago.

Desulfurization

In iron and steel plants, one of the procedures that will have to be determined by the audits is desulfurization: the removal and reuse of sulfur dioxide before its emission into the atmosphere. According to Katia Medeiros, in Brazil there is virtually no control over the synergic effects (mixtures) produced by the iron and steel plants' coking gases.

Bayer do Brasil's director of environment, Herbert Than, thinks that the law should take effect only after limitations are defined for the environmental audits. Than argued: "The removal of residues generated in each production phase is too sophisticated for Brazil, which even treats its sanitary sewage as it pleases."

According to Feema's [State Environmental Engineering Foundation] technical standards coordinator, Luis Heckmaier, that entity will immediately begin notifying business firms of the law's requirements.

Waste Reduction Could Be a Good Investment

Will it be possible for an industry to invest in controlling pollution and to profit from it? The experience of the North American chemical industry during recent years proves that it is.

A 1992 report from Inform, a respected U.S. research entity, releases precise data on curbing pollution at its origin, that is, on reducing chemical waste production. For example, with investments in 1989 and 1990, Ciba-Geigy cut its residue production by 76 percent. This represented an annual savings of $1.5 million on the company's balance sheet in the U.S.

Starting this year, that source of profit (resulting from reuse of materials, energy savings, increased efficiency, and others) could inspire Rio de Janeiro industrialists as well. Already in effect is the Law on Chemical Waste (No. 2011/92), written by Deputy Carlos Minc (PT), which calls for a minimum annual reduction of 10 percent in the production of waste classified as dangerous.

The law concentrates on oil refineries, chemical and petrochemical industries, and iron and steel and metal-working plants of large size. Its implementation will have an immediate impact on the clandestine dumping of toxic waste in the state (estimated by technicians and environmentalists at 65,000 tons per year).

Of the 27 companies cited by Inform, some have branches in Brazil. For example, Cyanamid reduced its waste by 94 percent, and began saving $220,000 per year. The director of regulations and institutional relations for Cyanamid in Brazil (located in Resende, RJ [Rio de Janeiro]), Milton Marchesi, although unaware of these data, claimed to be certain that the experiment would be repeated here.

Foreign Broadcast Information Service (FBIS) and Joint Publications Research Service (JPRS) publications contain political, military, economic, environmental, and sociological news, commentary, and other information, as well as scientific and technical data and reports. All information has been obtained from foreign radio and television broadcasts, news agency transmissions, newspapers, books, and periodicals. Items generally are processed from the first or best available sources. It should not be inferred that they have been disseminated only in the medium, in the language, or to the area indicated. Items from foreign language sources are translated; those from English-language sources are transcribed. Except for excluding certain diacritics, FBIS renders personal names and place-names in accordance with the romanization systems approved for U.S. Government publications by the U.S. Board of Geographic Names.

Headlines, editorial reports, and material enclosed in brackets [ ] are supplied by FBIS/JPRS. Processing indicators such as [Text] or [Excerpts] in the first line of each item indicate how the information was processed from the original. Unfamiliar names rendered phonetically are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear from the original source but have been supplied as appropriate to the context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by the source. Passages in boldface or italics are as published.

SUBSCRIPTION/PROCUREMENT INFORMATION

The FBIS DAILY REPORT contains current news and information and is published Monday through Friday in eight volumes: China, East Europe, Central Eurasia, East Asia, Near East & South Asia, Sub-Saharan Africa, Latin America, and West Europe. Supplements to the DAILY REPORTs may also be available periodically and will be distributed to regular DAILY REPORT subscribers. JPRS publications, which include approximately 50 regional, worldwide, and topical reports, generally contain less time-sensitive information and are published periodically.

Current DAILY REPORTs and JPRS publications are listed in *Government Reports Announcements* issued semimonthly by the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, Virginia 22161 and the *Monthly Catalog of U.S. Government Publications* issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

The public may subscribe to either hardcover or microfiche versions of the DAILY REPORTs and JPRS publications through NTIS at the above address or by calling (703) 487-4630. Subscription rates will be provided by NTIS upon request. Subscriptions are available outside the United States from NTIS or appointed foreign dealers. New subscribers should expect a 30-day delay in receipt of the first issue.

U.S. Government offices may obtain subscriptions to the DAILY REPORTs or JPRS publications (hardcover or microfiche) at no charge through their sponsoring organizations. For additional information or assistance, call FBIS, (202) 338-6735,or write to P.O. Box 2604, Washington, D.C. 20013. Department of Defense consumers are required to submit requests through appropriate command validation channels to DIA, RTS-2C, Washington, D.C. 20301. (Telephone: (202) 373-3771, Autovon: 243-3771.)

Back issues or single copies of the DAILY REPORTs and JPRS publications are not available. Both the DAILY REPORTs and the JPRS publications are on file for public reference at the Library of Congress and at many Federal Depository Libraries. Reference copies may also be seen at many public and university libraries throughout the United States.